The Studies on the Residual Accommodation of Koreans

II. The Residual Accommodation under 0.5% Scopolamine and 1% Cyclogyl Cycloplegia

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ABSTRACT

This study was conducted to determine how much of a residual accommodation remained under 0.5% scopolamine and 1% cyclogyl in young Koreans ranged from 6 years to 20 years.

The amount of the residual accommodation was measured by the blur point method, and the following results were obtained.

1) The average residual accommodation for 150 eyes was 0.99 D under 0.5% scopolamine and for 96 eyes was 1.53 D under 1% cyclogyl.

2) In comparing the cycloplegic agents, 0.5% scopolamine was almost parallel with 1% atropine (0.96 D) and 1% cyclogyl was almost parallel with 5% homatropine (1.42 D).

3) The residual accommodation under 0.5% scopolamine and 1% cyclogyl showed a gradual decrease with increasing age as first reported for 1% atropine and 5% homatropine.

4) In comparing with foreign countries, the residual accommodation in Koreans was at a similar level with white people.

INTRODUCTION

A review of the literature on cycloplegic refraction, covering the past quarter century, indicates that a wide variety of dosage schedule and a wide variety of drugs such as homatropine with and without paretrine, benzedrine, or cocaine, scopolamine, atropine, methylnaltrine, dibutyl sulfate, cyclogyl and several other new drugs have been employed by various authors with an apparently wide range of results insofar as residual accommodation was concerned. The disagreement regarding cycloplegia were not only based upon different cycloplegics but on differences of race, age, method, and cooperation of the patients.

Our studies, concerning the residual accommodation under 0.5% scopolamine and 1% cyclogyl cycloplegia follows the first report using 1% atropine and 5% homatropine cycloplegia, were made on young Koreans. Our results are compared with the results of foreign authors as well as comparing the four kinds of cycloplegics.

MATERIALS AND METHODS

The survey was made on young Koreans whose ages ranged from 6 years to 20 years, who had no refractive error, no change in the anterior segment or the retina, and had no general disease.

The cycloplegic drugs, 0.5% scopolamine for 150 eyes and 1% cyclogyl for 96 eyes, were instilled into the conjunctival sac 3 times at 5 minute intervals for scopolamine and 2 times at 10 minute intervals for cyclogyl. The measurements were taken one hour later.

The residual accommodation was measured by the blur point method after a +3.00 D lens was added to the previously determined distance correction using the same method as in the author’s first report.
RESULT

Table 1 and 2 demonstrate according to age the amount of residual accommodation under
scopolamine

<table>
<thead>
<tr>
<th>Age</th>
<th>No. of Eye</th>
<th>Near Blur Point</th>
<th>Distance Blur Point</th>
<th>Residual Accommodation</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>6~10</td>
<td>50</td>
<td>26.1 cm (3.85D)</td>
<td>36.9 cm (2.71D)</td>
<td>1.12 D</td>
<td>0.44</td>
</tr>
<tr>
<td>11~15</td>
<td>54</td>
<td>25.4 cm (3.73D)</td>
<td>36.2 cm (2.76D)</td>
<td>0.99 D</td>
<td>0.55</td>
</tr>
<tr>
<td>16~20</td>
<td>46</td>
<td>27.1 cm (3.69D)</td>
<td>35.2 cm (2.84D)</td>
<td>0.85 D</td>
<td>0.41</td>
</tr>
<tr>
<td>Average</td>
<td>150</td>
<td>26.5 cm (3.77)</td>
<td>36.1 cm (2.78D)</td>
<td>0.99 D</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Residual accommodation under 1% cyclogyl

<table>
<thead>
<tr>
<th>Age</th>
<th>No. of Eye</th>
<th>Near Blur Point</th>
<th>Distance Blur Point</th>
<th>Residual Accommodation</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>6~10</td>
<td>34</td>
<td>23.1 cm (4.26D)</td>
<td>36.3 cm (2.75D)</td>
<td>1.57 D</td>
<td>0.59</td>
</tr>
<tr>
<td>11~15</td>
<td>32</td>
<td>23.3 cm (4.29D)</td>
<td>37.1 cm (2.69D)</td>
<td>1.60 D</td>
<td>0.56</td>
</tr>
<tr>
<td>16~20</td>
<td>30</td>
<td>23.8 cm (4.20D)</td>
<td>36.0 cm (2.78D)</td>
<td>1.42 D</td>
<td>0.33</td>
</tr>
<tr>
<td>Average</td>
<td>96</td>
<td>23.4 cm (4.27D)</td>
<td>35.4 cm (2.74D)</td>
<td>1.53 D</td>
<td></td>
</tr>
</tbody>
</table>

0.5% scopolamine and 1% cyclogyl. The average residual accommodation for 150 eyes under 0.5% scopolamine was 0.99 D and the average residual accommodation for 96 eyes under 1% cyclogyl was 1.42 D.

DISCUSSION

The ideal cycloplegics for refraction should have the following characteristic: 1) rapid cycloplegic effect; 2) maximum relaxation of the ciliary muscle; 3) satisfactory mydriasis; 4) rapid recovery from the cycloplegic effect; and 5) no toxic or allergic side reactions of a local or systemic nature.

According to Marron, scopolamine was very powerful and fast acting, and with its use the range of the residual accommodation diminished quickly, so that the maximum effect was obtained in forty minutes to a low of 1.60 D, which persisted for at least ninety minutes. The accommodative power gradually returned, so that by the third day, the average patient could read. The normal range of accommodation was present by the tenth day. However, scopolamine could not be used for cycloplegia because of frequent toxic side reactions.

According to Raskorshek and McIntire, cyclo-

![Graph showing comparative residual accommodation](image_url)

**Fig. 1. Comparative Residual Accommodation under 1% Atropine, 0.5% Scopolamine, 5% Homatropine and 1% Cyclogyl in Different Age Groups.**
The studies on the residual accommodation of Koreans

gyl seems to arrive at its maximum effect in thirty minutes and the recovery time was most rapid. Most patients were able to read the newspaper within six hours and cyclogyl was the best for no residual accommodation.

In the author’s result, however, cyclogyl was an incomplete cycloplegic in younger individuals than was atropine and scopolamine.

In comparing each cycloplegic the residual accommodation of 0.5% scopolamine, 1% cyclogyl, 1% atropine and 5% homatropine, 1% scopolamine (0.99 D) was almost parallel with 1% atropine (0.96 D) and 1% cyclogyl (1.53 D) was almost parallel with 5% homatropine (1.42 D).

The residual accommodation under 0.5% scopolamine and 1% cyclogyl showed a gradual decrease with increasing age except for reversed 11 to 15 in the two age groups, 6 to 10 years and over 10 years, using 1% cyclogyl.

In comparison with white people, the residual accommodation of Koreans was almost parallel. Darkly pigmented eyes were usually considered less responsive to cycloplegics, especially homatropine and cyclogyl. According to Ehrlich, the average residual accommodation was 3.10 D under 2% homatropine, 3.25 D under 0.5% cyclogyl and 1.90 D under 1% cyclogyl in the eyes of darkly pigmented irides. Also, Gettes reports that 1% atropine should be used in children with darkly pigmented irides.

Emphasis was placed on the clarification of what constitutes adequate and effective cycloplegia. It has been asserted previously by Milder and Gettes, that there must be less than 2.00 D of the residual accommodation at the time of retinoscopy for the cycloplegic agent to be effective.

Table 3 shows the comparative cycloplegic effect of 1% atropine, 0.5% scopolamine, 5% homatropine and 1% cyclogyl all of which do not exceed 2.00 D. Atropine and scopolamine were more effective than homatropine and cyclogyl.

Table 3. Comparative cycloplegic effectivity under 1% atropine, 0.5% scopolamine, 0.5% homatropine & 1% cyclogyl.

<table>
<thead>
<tr>
<th>Age</th>
<th>1% Atropine</th>
<th>0.5% Scopolamine</th>
<th>5% Homatropine</th>
<th>1% Cyclogyl</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 to 10</td>
<td>93.5%</td>
<td>91.7%</td>
<td>64.5%</td>
<td>71.5%</td>
</tr>
<tr>
<td>11 to 15</td>
<td>100.0%</td>
<td>94.3%</td>
<td>84.8%</td>
<td>73.1%</td>
</tr>
<tr>
<td>16 to 20</td>
<td>100.0%</td>
<td>96.5%</td>
<td>89.0%</td>
<td>91.7%</td>
</tr>
</tbody>
</table>

In children less than 10 years old, homatropine and cyclogyl were frequently incompletely effective for accurate retinoscopy.

REFERENCES


